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INTEGRATION OF TQM AND FINANCIAL MANAGEMENT: IMPACT ON PROFITABILITY AND RISK

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Abstract: This paper examines the mechanisms through which Total Quality Management (TQM) influences firm profitability and risk, integrating quality principles with financial performance indicators and operational stability. The analysis begins from the premise that TQM is not merely an operational tool, but a strategic system that reduces process variability, lowers the costs of non-quality, and enhances the predictability of cash flows. The theoretical framework explains how leading quality indicators—such as defect rates, process capability and first-pass yield—translate into lagging financial metrics including margins, ROIC and free cash flow. The proposed measurement model incorporates cost-of-non-quality quantification, sensitivity and scenario analysis, and panel econometric models with fixed effects that link TQM maturity to profitability and financial volatility while controlling for firm size, industry and leverage. The findings reaffirm that TQM simultaneously acts as a driver of profitability and an embedded mechanism of risk mitigation, enabling organizations to achieve long-term sustainability, more stable revenue streams and stronger resilience to market and operational disruptions.

Keywords: Total Quality Management, profitability, financial risk, process variability, integrated measurement systems

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Introduction

Total Quality Management (TQM) emerged from the paradigm of continuous improvement, statistical process control and a customer-oriented organizational culture. At the same time, modern financial management emphasizes cash-flow stability, risk mitigation and sustainable profitability, where the value of a firm is increasingly assessed through the predictability of future cash flows rather than short-term earnings. Although TQM is often perceived as an “operational” discipline, its effects are predominantly financial: reduction of quality-related costs, stabilization of process variability, faster inventory turnover, decreased waste and inefficiencies, and revenue growth through customer loyalty and stronger market positioning (Milovanović, 2014; Zehir & Zehir, 2023).

Empirical research across sectors shows that higher levels of TQM implementation are significantly associated with improved financial outcomes. In university hospitals, A'aqoulah et al. (2025) demonstrated that high TQM implementation substantially increases the likelihood of achieving effective financial performance, especially when teamwork and communication of strategic objectives are strongly supported by senior management. Similarly, a study conducted in Turkish hospitals shows that dimensions such as customer focus and process management account for the largest variance in financial outcomes, indicating that the so-called “operational” quality decisions directly influence cash-flow dynamics and long-term financial sustainability (Zehir & Zehir, 2023).

In the higher education sector, Shafqat et al. (2021) found that TQM exerts a significant positive impact on both financial and non-financial performance, with service-quality indicators (reliability, responsiveness, assurance, empathy) acting as leading predictors of future financial results. This suggests that non-financial quality metrics are not merely “soft” indicators, but early signals of future revenues, margins and business stability. Research in the hotel industry also indicates that TQM functions as a profitability factor by either increasing revenue through higher customer satisfaction and loyalty or reducing operational costs and improving capacity utilization (Milovanović, 2014).

Recent literature additionally positions TQM within a broader strategic framework that includes entrepreneurial orientation and corporate social

responsibility. Ibarra-Cisneros et al. (2022) demonstrate that TQM, entrepreneurial orientation and CSR act as complementary strategies that jointly enhance the overall performance of hotels—implying that TQM is relevant not only for process efficiency but also for managing reputational risk and supporting long-term organizational resilience (Dašić, 2024; Kovačević, 2024).

However, most existing studies operationalize TQM effects through aggregated indicators of “organizational performance” (e.g., ROA, ROE, revenue growth, customer satisfaction), while the direct links between TQM practices and cash-flow dynamics, profit volatility and risk profiles remain insufficiently explored (Shafqat et al., 2021; Zehir & Zehir, 2023). This gap highlights the need for integrated measurement systems capable of connecting leading quality indicators (defects, complaints, cycle time, process stability, customer satisfaction (Dašić, 2021; Stanković, 2023)) with lagging financial outcomes (cash flows, profit margins, cost of capital, risk measures (Dašić, et al., 2023)).

The central premise of this paper is that an integrated measurement system that explicitly connects leading quality indicators with financial results enables more predictable cash flows, lower risk dispersion and higher capital productivity, because management receives early signals of quality deterioration before it materializes in financial losses (A'aqoulah et al., 2025). Therefore, the paper's goal is to provide an analytical model that connects key TQM practices—leadership, process management, employee involvement, customer focus, and continuous improvement—to risk and profitability. It also aims to develop industry-wide implementation guidelines, with a focus on creating indicator systems that simultaneously meet operational and financial management requirements (Dašić, 2024b; Narančić, 2024).

Theoretical Framework Linking Quality and Financial Performance

The relationship between quality management and financial performance is grounded in the idea that value creation does not emerge solely from financial decisions but from systematic improvements in processes, reductions in variability, and the long-term development of customer trust. Core TQM principles—customer focus, process orientation, leadership commitment, employee involvement, and data-based measurement and learning—constitute an organizational infrastructure that generates financial

outcomes rather than a set of isolated operational tools. Recent systematic reviews of financial performance in the manufacturing sector indicate that traditional financial metrics such as sales revenue, profit margins, ROA, ROE, EBITDA, and free cash flow (FCF) remain dominant, but non-financial determinants such as product quality, delivery reliability and customer satisfaction increasingly shape these outcomes (Baby et al., 2024).

Empirical studies examining the relationship between formal quality management systems (e.g., ISO 9001 and comprehensive TQM programs) and financial results show a more nuanced picture than the assumption that certification automatically generates profitability. A study of 548 Czech firms revealed that ISO 9001-certified companies exhibited slightly higher ROA values over a seven-year period, but the difference was not statistically significant; the same applied to firms that systematically tracked quality-related costs compared to those that did not (Pokorná, 2013). These findings suggest that certification alone is insufficient—what matters is how TQM principles are translated into process control, cost management, and risk mitigation.

The central theoretical bridge between quality improvement and financial outcomes is the concept of quality costs, particularly the costs of non-quality. The classical PAF model (prevention–appraisal–failure) distinguishes between costs of prevention, inspection, internal failures, and external failures. A study of firms listed on the Zagreb Stock Exchange showed that organizations that quantify and report their quality costs achieve higher levels of product quality (performance, reliability) and more clearly identify the financial benefits of preventive and appraisal activities (Pekanov Starčević et al., 2015). This supports the causal chain frequently described in the literature: (1) quality practices and preventive actions → (2) lower process variability and defect rates → (3) reduced costs of non-quality (rework, scrap, warranties, complaints, hidden factory costs) → (4) higher profit margins, faster inventory turnover, and more stable cash flows.

Within this causal chain, Six Sigma and related methodologies provide a formal framework for quantifying and reducing variability using indicators such as DPMO (defects per million opportunities), FPY (first-pass yield), and OEE (overall equipment effectiveness). A case study from the metal packaging industry demonstrates that systematic allocation of resources to Six Sigma projects—based on identifying root causes of defects and

reducing process variation—not only lowers non-quality costs but also produces measurable improvements in liquidity and decreases delays in cash-flow cycles (Sánchez-Rebull et al., 2020). These findings reinforce the argument that operational quality measures function as leading indicators, while profit and cash-flow metrics are lagging results of previously implemented quality decisions.

The integration of leading (operational/quality) and lagging (financial) indicators is most clearly articulated in the Balanced Scorecard (BSC) and related integrated performance dashboards. BSC distinguishes between outcome measures (e.g., profitability, revenue, market share) and performance drivers (e.g., process quality, customer satisfaction, employee capabilities), emphasizing that financial indicators are retrospective, whereas non-financial indicators capture the conditions that determine future results (Zizlavsky, 2014). Within a TQM context, this means that indicators such as DPMO, FPY, OEE, customer-satisfaction indices, or cycle-time metrics must be positioned as leading indicators that predict trends in EBITDA, ROIC and free cash flow.

Recent systematic reviews also highlight that organizations using integrated measurement systems—combining financial and non-financial metrics and explicitly mapping causal relationships—demonstrate more stable returns and lower performance volatility during supply-chain disruptions and macroeconomic shocks (Baby et al., 2024). However, the same studies caution that linking TQM metrics to financial outcomes requires careful model design: selection of relevant leading indicators, explicit consideration of time lags between quality improvements and financial effects, and rigorous control for confounding variables such as market changes, investment cycles, and strategic shifts.

The cost-of-quality paradigm as the mechanism that converts variability and defects into financial outcomes; integrated measurement systems that combine leading quality metrics with lagging financial indicators within unified dashboards; and the fundamental principles of Total Quality Management (TQM) as a source of process improvements and organizational capability are the foundations of the theoretical framework that links quality and financial performance. In order to produce quantifiable financial value, TQM practices must be systematically linked to cost management, risk mitigation, and long-term strategic objectives. The

literature repeatedly demonstrates that formal certification or ad hoc quality initiatives do not guarantee superior financial performance.

Model for Measuring the Impact of TQM on Profitability and Risk

Developing a robust model for measuring the financial consequences of Total Quality Management (TQM) requires formalizing the channels through which quality practices affect profitability, cash-flow stability, and firm-level risk exposure. While many studies confirm the positive association between TQM and organizational performance, fewer explicitly quantify the mechanisms—cost reduction, revenue stability, and risk mitigation—through which these effects materialize. A comprehensive measurement approach therefore requires a combination of cost-of-quality analytics, sensitivity and scenario modelling, and econometric estimation linking TQM maturity to key financial indicators such as ROIC, EBITDA margins and free cash flow (FCF).

Quantifying Savings Through Cost-of-Non-Quality Analysis

The most direct financial link between TQM and profitability lies in quantifying the reduction of non-quality costs. These include internal failures (scrap, rework, downtime), external failures (complaints, warranty claims, recalls), appraisal costs, and hidden opportunity losses. Empirical work shows that organizations that systematically allocate and monitor their cost-of-quality achieve significant improvements in resource efficiency and profit margins. For instance, a study of Indian automotive suppliers demonstrated that structured cost-of-quality programs can reduce total failure costs by more than one-third, while simultaneously improving throughput and capacity utilization (Mukhopadhyay & Gupta, 2014). This underscores the need for integrating cost-of-non-quality accounting into the TQM measurement model.

To translate these savings into financial statements, firms may use marginal-analysis techniques, evaluating how incremental reductions in defect rates affect variable costs, inventory levels, and operating margins. Sensitivity analyses help identify thresholds beyond which improvements in defect rates have disproportionate effects on profitability, while scenario modelling (baseline, optimistic, and stress scenarios) captures the uncertainty inherent in quality and process variability (Gołaś & Mazur, 2023). Together, these

methods provide a structured basis for quantifying TQM-driven savings and estimating their impact on the firm's ROIC and operating cash flows.

Risk Profile: Process Stability, Volatility Reduction and Working-Capital Discipline

Beyond cost savings, TQM maturity affects a firm's risk profile, especially through the stabilization of operational processes. Reduced process variability leads to more predictable cycle times and fewer disruptions in production or service delivery. In turn, this enhances the stability of revenues and gross margins. Firms with higher process capability indices (e.g., Cp, Cpk) experience less volatility in demand fulfillment and exhibit stronger resilience during supply-chain shocks (Li et al., 2020). These effects extend to working-capital management: fewer defects, shorter lead times and lower rework requirements decrease inventory buffers and reduce cash conversion cycles.

Furthermore, recent research emphasizes that TQM-driven process discipline positively influences downside risk—capturing the probability of poor financial outcomes—and not merely average profitability. In a large-scale study of Chinese manufacturing firms, operational excellence practices significantly reduced profit volatility and downside tail risk, confirming that quality improvements act as a form of embedded risk management (Zhang & Wu, 2023). Thus, the proposed model must incorporate measures of financial volatility (variance of ROA/ROIC, volatility of gross margins) as key dependent variables.

Proposed Methodological Approach for Measuring TQM's Financial Effects

A rigorous empirical assessment of TQM effects requires an econometric specification capable of isolating causal relationships from confounding factors. The recommended approach is the use of panel-data models with fixed effects, which control for unobserved heterogeneity across firms (e.g., managerial culture, technology base, regional characteristics). The core explanatory variable should be a TQM maturity index, constructed from principles such as leadership engagement, process management, employee involvement, use of statistical methods, and customer focus (Fonseca, 2021). Such indices offer a continuous measure of TQM development rather than a simple binary classification (certified vs. non-certified).

The baseline fixed-effects model can be specified as:

$$\text{Financial}_{it} = \beta_1 \text{TQM_Maturity}_{it} + \beta_2 \text{Controls}_{it} + \alpha_i + \lambda_t + \varepsilon_{it}$$
$$\text{Financial}_{it} = \beta_1 \text{TQM_Maturity}_{it} + \beta_2 \text{Controls}_{it} + \alpha_i + \lambda_t + \varepsilon_{it}$$

where the dependent variables include:

- **ROIC** (return on invested capital)
- **EBITDA margin**
- **Free cash flow (FCF)**
- **Volatility indicators** (variance of ROA/ROIC, downside risk measures)

Control variables should include firm size, industry sector, leverage, capital intensity, and export orientation, as recommended in contemporary performance-modelling literature (Hernández-Vivanco et al., 2019). The model may be extended by lagging TQM maturity scores to account for time delays between quality improvements and financial effects.

Finally, integrating financial and non-financial indicators into a unified analytical dashboard—using weighted composite indices or structural-equation models—enables firms to track both direct and indirect pathways of TQM influence.

Conclusion

The analysis presented in this work demonstrates that Total Quality Management (TQM) represents far more than an operational philosophy focused on defect reduction or process improvement. When systematically implemented and embedded in organizational strategy, TQM becomes a powerful financial mechanism capable of shaping profitability, cash-flow dynamics and risk exposure. Across industries and organizational contexts, the evidence illustrates that quality practices operate through a clear set of causal pathways: they reduce process variability, lower the costs associated with internal and external failures, stabilize revenue flows and improve the efficiency of working capital. These mechanisms underline the shift from viewing quality as a cost center to understanding it as a fundamental driver of long-term financial performance.

A central insight emerging from the theoretical and methodological discussions is that TQM's financial impact depends on the degree to which quality principles are transformed into measurable operational and financial effects. Customer orientation, leadership commitment, employee involvement and continuous learning create the organizational infrastructure from which financial benefits arise. However, these principles must be operationalized through robust process metrics, structured cost-of-quality systems and statistical tools capable of capturing variability and predicting performance trends. Quality practices that remain ceremonial, superficial or disconnected from decision-making processes do not generate measurable improvements; conversely, when quality systems become the basis for managerial discipline, they directly influence margins, turnover and liquidity.

This research also highlights that TQM contributes to the reduction of financial risk—not merely by improving efficiency, but by increasing the predictability of operations. Stable processes reduce disruptions, prevent capacity losses, and create more reliable flow times, resulting in more consistent revenues and margins. In an environment characterized by supply-chain volatility, competitive uncertainty and macroeconomic shocks, this stabilizing function of TQM becomes strategically crucial. Firms with mature quality systems demonstrate stronger resilience and lower downside exposure, reinforcing the argument that quality management is a form of embedded risk mitigation rather than an optional operational upgrade.

A key contribution of the presented model is the proposed methodological approach for empirically assessing TQM's financial impact. By applying panel-data models with fixed effects, organizations and researchers can isolate the influence of TQM maturity on profitability (ROIC, EBITDA margins) and risk indicators (variance, downside risk), while controlling for structural differences among firms. This approach also recognizes the temporal dynamics between operational improvements and financial results, emphasizing the need for lagged effects and longitudinal measurement. Linking leading indicators of quality—such as defect rates, process capability, cycle times and first-pass yield—with lagging financial outcomes creates a rigorous and actionable measurement architecture that supports better managerial decisions.

Taken together, these findings underscore the need for an integrative perspective on quality management, one that bridges operational metrics

with financial performance and risk indicators. Organizations seeking measurable financial gains must move beyond compliance-oriented programs and instead adopt a maturity-based approach that connects TQM principles with cost management, capital productivity and strategic risk control. Quality becomes most impactful when embedded in a coherent system of indicators, where non-financial measures act as early signals of future financial outcomes and where the effects of process improvements can be traced through the entire value-creation chain. TQM should be understood as a multi-dimensional management system whose financial consequences depend on organizational discipline, measurement infrastructure and strategic alignment. Its impact is neither automatic nor instantaneous; it emerges gradually, through accumulated improvements in processes, cost structures and learning capabilities. Firms that invest in this long-term perspective gain not only higher profitability and more stable cash flows, but also enhanced resilience and lower exposure to adverse outcomes. By integrating quality practices with advanced measurement models, organizations can convert operational excellence into sustained financial and strategic advantage.

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INTEGRACIJA TQM-A I FINANSIJSKOG MENADŽMENTA: UTICAJ NA PROFITABILNOST I RIZIK

Sažetak: Ovaj rad ispituje mehanizme kroz koje Totalni menadžment kvalitetom (TQM) utiče na profitabilnost i rizik preduzeća, integrišući principe kvaliteta sa finansijskim pokazateljima performansi i operativnom stabilnošću. Analiza polazi od pretpostavke da TQM nije samo operativni alat, već strateški sistem koji smanjuje varijabilnost procesa, umanjuje troškove nekvaliteta i povećava predvidljivost novčanih tokova. Teorijski okvir objašnjava kako vodeći indikatori kvaliteta — poput stope defekata, sposobnosti procesa i prolaza iz prve — prelaze u završne finansijske metrike kao što su profitne marže, ROIC i slobodan novčani tok. Predloženi model merenja uključuje kvantifikaciju troškova nekvaliteta, analize osetljivosti i scenarija, kao i panel ekonometrijske modele sa fiksnim efektima koji povezuju zrelost TQM-a sa profitabilnošću i finansijskom volatilnošću, uz kontrolu veličine preduzeća, industrije i zaduženosti. Nalazi potvrđuju da TQM istovremeno deluje kao pokretač profitabilnosti i ugrađeni mehanizam za ublažavanje rizika, omogućavajući organizacijama dugoročnu održivost, stabilnije prihode i veću otpornost na tržišne i operativne poremećaje.

Ključne reči: totalni menadžment kvalitetom, profitabilnost, finansijski rizik, varijabilnost procesa, integrisani sistemi merenja

